

**WHAT IS CLAIMED IS:**

1. An optical signal processing element, comprising:
  - a first saturable absorber of which an passing power is more than a  
5 absorbed power thereof if an input optical signal having a power higher than a  
transparent input optical power is inputted, and of which the absorbed power  
is more than the passing power thereof if an input optical signal having a  
power lower than the transparent input optical power is inputted; and
  - an optical amplifier connected in series to the first saturable absorber  
10 and exhibiting an optical saturation when a power is higher than a saturation  
input optical power;
  - wherein a transparent output optical power outputted from the first  
absorber is not less than the saturation input optical power.
- 15 2. An optical signal processing element according to claim 1, further  
comprising a second saturable absorber connected to an output terminal of the  
optical amplifier.
3. An optical signal processing element according to claim 2, wherein the  
20 transparent input optical power of the first saturable absorber is not less than a  
transparent input optical power of the second saturable absorber.
4. An optical signal processing element according to claim 1, wherein the

first saturable absorber and the optical amplifier are formed on a substrate, the element further comprising:

- the substrate;
- a first cladding layer formed on the substrate;
- 5 an active layer formed on the first cladding layer;
- a second cladding layer formed on the active layer;
- dielectrics formed on both facets;
- an upper electrode formed on an upper surface above the first cladding layer, the second cladding layer and the active layer; and
- 10 a lower electrode formed on a lower surface below the first cladding layer, the second cladding layer and the active layer;
- wherein, the upper electrode is divided correspondingly to the first saturable absorber and the optical amplifier, and the lower electrode is formed in a body, to connect the first saturable absorber and the optical
- 15 amplifier in series.

5. An optical signal processing element according to claim 4, wherein the active layer comprised InGaAsP group triple layers including a first layer made of a quaternary compound of 1.24  $\mu\text{m}$  bandgap, a second layer made of a quaternary compound of 1.55  $\mu\text{m}$  bandgap and formed on the first layer and a
- 20 third layer made of a quaternary compound of 1.24  $\mu\text{m}$  bandgap and formed on the second layer.

6. An optical signal processing element according to claim 1, further comprising a filter at an output end of the optical amplifier,
- wherein the total power of the optical signal and a continuous wave signal having a desired wavelength less than the transparent input optical
- 5 power is not less than the transparent input optical power, and
- wherein the filter selects a wavelength of a desired wavelength.